American Gynecological Society, but received no benefit, and, I think, ultimately committed suicide, owing to the severity of her symptoms.

If the bladder be much contracted and very irritable, benefit can often be obtained by distending the bladder with fluids. For this purpose, weak salt solutions can be used, or solutions of boric acid, or other similar agent. If there be granulations around the ureteric openings, congested areas or ulcerations, they can be treated topically by the aid of Kelly's speculum. I have recently scored a brilliant success in the local treatment of such a case.

From what has already been said, it will be seen that much more research is necessary before we can arrive at a truly satisfactory treatment of this affection. If, however, I can succeed in rousing the attention of the profession to its existence and to the necessity of recognizing and treating it, I think that the beginning of the end will have been reached.

CERTAIN CASES OF HETEROTOPIA OF WHITE MATTER OCCURRING IN THE HUMAN MEDULLA OBLONGATA.

BY JAMES D. HEARD, M.D.,
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(Communication from the Laboratory of Prof. Obersteiner, in Vienna.)

IN the extensive literature of the human central nervous system but little mention is made of the presence of congenital histological anomalies in the cord and medulla oblongata. In the cord, Van Gieson[1] could find mention of but four cases of true misplacement of gray matter, while no cases of heterotopia of white matter had been published. In the medulla oblongata anomalous bundles of white matter had been observed in three instances. To these observations Van Gieson added a case of his own, and Schaffer[2] has since added a fifth. If with these be included the bundle described by Henle[3] as an occasional anomaly, but afterwards[4] identified by him with the respiratory fasciculus, the number of cases rises to six. These six comprise the only genuine cases of heterotopia of white matter in the medulla of which I can find record. The cases are as follows:

CASE I.—In the twenty-first volume of the *Archiv für Psychiatrie*, Prof. Pick[5] reported the observation of an anomalous bundle of nerve fibres occurring unilaterally in a human medulla oblongata. It commenced at the level of decussation of the pyramids as a small, sharply circumscribed collection of nerve fibres originating from the remains of the lateral column, and occupying a position anterior and somewhat mesial of the head of the posterior horn. The fibres comprising the column were easily distinguished from those surrounding it by reason of their larger calibre and consequent darker stain (Weigert method as modified by Pal). As the bundle ascended its diameter increased and arching fibres appeared, which separated it from decussating fibres and gray substance. At the level of the upper third of the olive its component fibres separated, and could be followed into the corpus restiforme; while at a somewhat higher level the anomalous structure had entirely disappeared. At no part in its intermediate course could Pick trace any connection between the fibres composing the bundle and surrounding structures. He can offer no explanation as to the physiology of the bundle, but regards it as an abnormal path for the fibres which the corpus restiforme always receives from the lateral columns. He identifies it with the bundle of Henle mentioned above, which is described in the first edition of the *Handbuch der Nervenlehre* as "one or as two cylindrical and sharply circumscribed nerve-like cords of occasional occurrence, and having a diameter of 25 to 50 mm., always occurring unilaterally, and situated in the posterior boundaries of the reticular substance, anterior to the head of the posterior horn." As Henle subsequently identified this structure with the respiratory fasciculus (*Handbuch der Nervenlehre*, 2d edition), Pick's observation possesses the merit of a rediscovery.

CASE II.—Cramer,[6] in the examination of the central nervous system in a case of cerebellar hemiatrophy, discovered an anomalous bundle of white fibres situated upon the side of the lesion, and corresponding in size, cross section, and location with the bundle of Pick. It arose at the level of decussation of the pyramids, and reached its greatest development at the sensory decussation. Here it was seen as a nerve-like cord, completely surrounded by arching fibres, and having no demonstrable connection with surrounding structures. At the lower third of the olive the column had subdivided into two, and fibres were observed to leave it and radiate in the direction of the corpus restiforme. That these fibres really entered the restiform body could not, however, be demonstrated. Although the exact origin and the destination of the fibres was not determined, the column was regarded by Cramer as identical with that of Pick, and he reached the same conclusion as to its anatomical significance—namely, as an abnormal path for communicating fibres between lateral column and corpus restiforme, and possibly cerebellum.

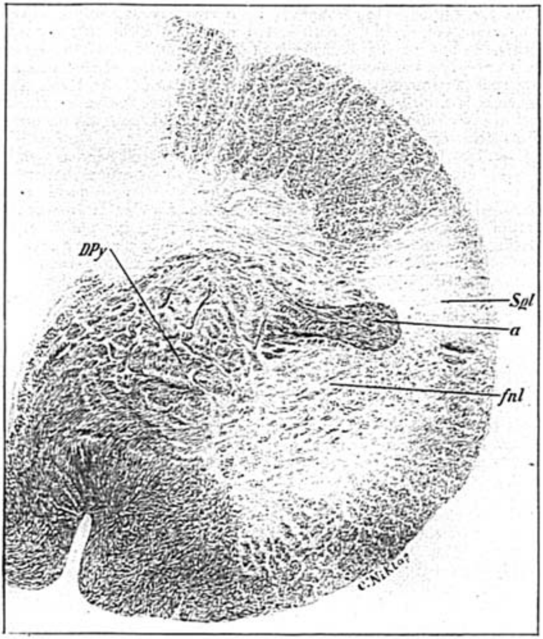
CASE III.—Schaffer,[7] in the *Neurologisches Centralblatt* for August, 1890, reported the observation of an abnormal fasciculus which arose at the upper level of the decussation of the pyramids, and was situated internal and posterior to the gelatinous substance of Rolando, exactly at the angle which the posterior horn forms with the nucleus funiculus cuneatus. The cross section of the bundle was elliptical, and it was sharply circumscribed anteriorly, internally, and posteriorly by arching fibres. Internally the fibres composing the bundle had a longitudinal direction, while the fibres of the outer half had an oblique course, which, however, tended to become longitudinal as the fibres neared the centre of the bundle. Externally they could be traced to the cells of the nucleus funiculus cuneatus. Although the column was seen to deviate toward the respiratory fasciculus at the level of the lower third of the olive, no communication with this structure was demonstrable.

At a somewhat higher plane the bundle had disappeared, its fibres having entered the corpus restiforme.

Although the location of the bundle is posterior to that of Pick's, and its fibres appear to originate in the posterior instead of the lateral columns, Schaffer identifies the two structures. He regards the bundle as an abnormal path for those fibres which the corpus restiforme receives from the posterior column.

CASE IV.—Kronthal,[7] in a case of bulbar paralysis, discovered two anomalous unilateral bundles of white fibres lying mesial of the hypoglossus nucleus, near the floor of the fourth ventricle. After thirteen sections had been cut the bundles united and ganglion cells appeared.

FIG. 1.



Transverse section at lower level of decussation of pyramids.

Sgl, substantia gelatinosa. *fnl*, Lateral column; dark fibres separate from those engaged in the decussation, and proceed laterally, to collect at the inner border of the substantia gelatinosa as a distinct round bundle, *a*.

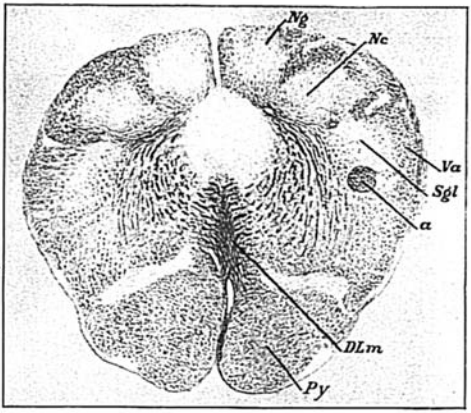
The origin of the bundles could not be determined, and after the appearance of the ganglion cells they could no longer be traced.

Case V.—In the examination of a human medulla, Van Gieson[1] noticed the presence of two anomalous bundles of white fibres which lay mesial of the hypoglossus nucleus. They were regarded as stray bundles from the posterior longitudinal fasciculus, or as bundles of association fibres for the cells of the hypoglossal nuclei.

Case VI.—The case of Henle. It is mentioned above, and does not require further consideration.

To these cases I wish to add the following: Case I. is from a medulla cut in series by me in the laboratory of Prof. Obersteiner, in Vienna; Case II., from one cut by Dr. Kornfeld. For permission to publish this second case and for much assistance I am indebted to Prof. Obersteiner.

Fig. 2.



Section from the level of the sensory decussation. (*DLm.*)

Py, Pyramids. *Sgl*, Substantia gelatinosa. *Va*, Ascending root of trigeminus *Nc* and *Ng*, Nuclei of funiculus cuneatus and gracilis. Bundle (*a*) is plainly visible.

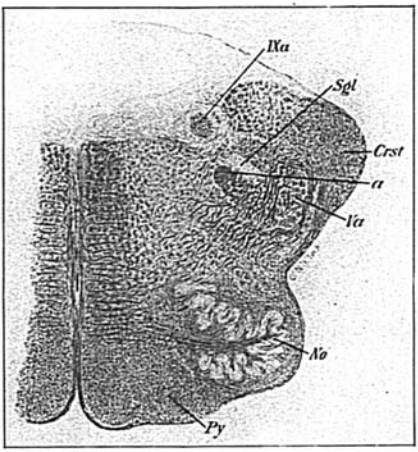
Case I.—The antecedents of the medulla are unknown. As, however, it had been sent to the laboratory from the pathological department for use as a normal specimen, it may be assumed with comparative certainty that the patient had not died of a disease of the nervous system.

In the subsequent microscopical examination of the serial sections no pathological changes were demonstrable, but two anomalous bundles of nerve fibres were discovered.

The first of these, which I will term bundle *a*, takes origin at the lower level of decussation of the pyramids. Here, as seen in Fig. 1, a number of fibres (*a*) separate from those engaged in the decussation (*DPy*), and proceed outward and slightly backward to a position anterior and internal to the head of the posterior horn (*Sgl*). They may be readily distinguished from the fibres of the funiculus lateralis (*fnl*) by reason of their greater calibre and consequent darker stain.

In Fig. 2, representing a section at the level of the sensory decussation (*DLm*), these fibres are seen to have united to form a circular, compact bundle, which occupies a position anterior and internal to the substantia gelatinosa (*Sgl*) and ascending root of the trigeminus (*Va*). It is surrounded by fine arching fibres, and has a diameter of about 0.50 mm. No connection between it and the cells of the nucleus funiculus cuneatus (*Nc*), or those of the nucleus funiculus gracilis (*Ng*) is demonstrable. (Compare Schaffer's case.)

FIG. 3.



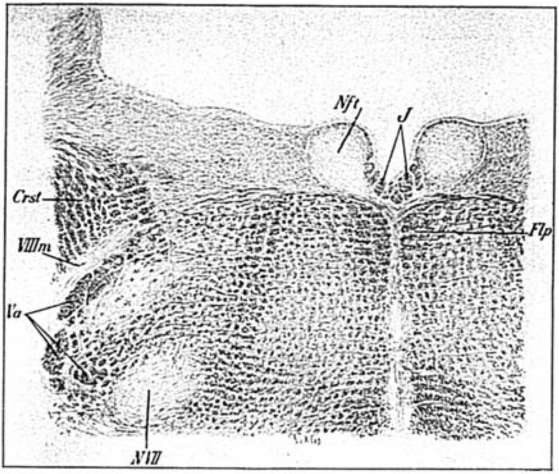
Section through the upper third of the olive.

Py, Pyramid. *Crst*, Corpus restiforme. *Sgl*, Substantia gelatinosa. The abnormal bundle, *a*, lies to the mesial side of the ascending root of the trigeminus, *Va*, and is shown to be entirely independent of the ascending root of the glosso-pharyngeal, *IXa*.

In Fig. 3, representing a section of the upper third of the olive, the bundle (*a*) is seen to still occupy its position in proximity to the substantia gelatinosa, and close to the inferior border of the ascending root of the trigeminus. The bundle is somewhat smaller than at lower levels, owing possibly to a more compact arrangement of its fibres, but in general characteristics it is unchanged. The ascending root of the glosso-pharyngeal (*IXa*), or respiratory bundle of Kraus, may be seen occupying a position dorsal and somewhat internal to the anomalous fasciculus. The entire independence of these structures is, however, well demonstrated. (Compare case of Henle.) No connection between the anomalous bundle and the corpus restiforme (*Crst*) is demonstrable upon this or upon other preparations.

At a somewhat higher level the bundle disappears, its fibres having separated and become lost among surrounding structures. The final destination of these fibres could not be determined, but there is no ground for assuming that they entered the corpus restiforme.

FIG. 4.

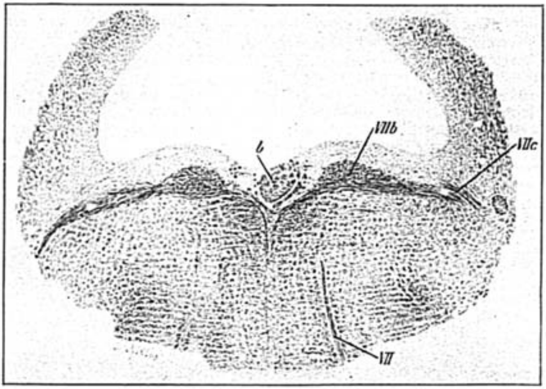


Section a little above the lower border of the pons.

N VII, Nucleus of the facial nerve. *VIIIm*, Median root of the auditory. *Crst*, Corpus restiforme. *Va*, Ascending root of the trigeminus. Bundle *a* is no longer to be seen. The second abnormal bundle, *J*, takes origin from the greatly enlarged nuclei funiculi teretes (*Nft*). *Flp*. Fasciculus longitudinalis posterior.

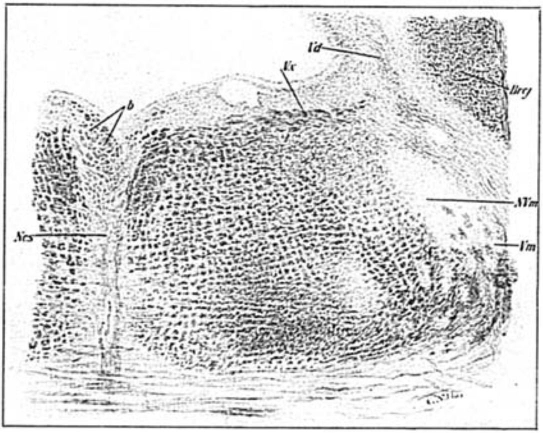
A second anomalous bundle appears in this medulla when we reach the level of exit of the eighth nerve. It is shown in Fig. 4 as a collection of small fasciculi (*J*) which run in a longitudinal direction near the floor of the fourth ventricle. To either side lie the nuclei funiculi teretis (*Nft*). These are enormously enlarged, and give off fibres to the anomalous fasciculi. The ascending root of the trigeminus is seen at *Va*, internal to the median root of the auditory (*VIIIm*). The structure at *N VII* is the facial nucleus. Bundle *a* has disappeared.

FIG. 5.



Bend of the knee of the facial (*VIIb* and *VIIc*). *VII.* Abducens nerve. The abnormal bundle, *b*, in the middle line.

FIG. 6.



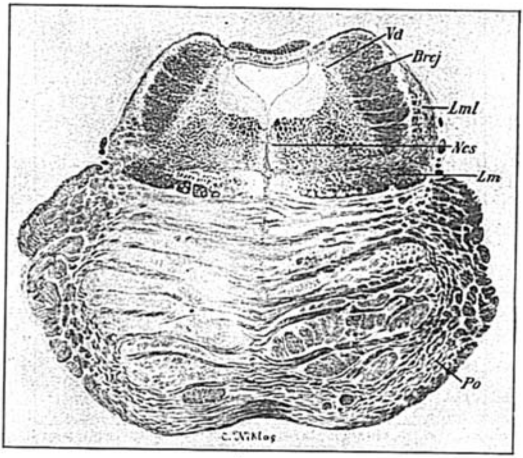
Region of the nucleus of the trigeminus.

NVm, Motor nucleus of trigeminus. *Vm*, Motor root of trigeminus. *Vx*, Crossed root. *Vd*, Ascending root. *Ncs*, Nucleus centralis superior. *b*, The anomalous bundle, which has subdivided into numerous smaller fasciculi.

At the level of the nucleus of the sixth nerve (Fig. 5) the greater number of the anomalous fasciculi have united to form a single large bundle (*b*). This is elliptical on cross section, and lies near the floor of the fourth ventricle, almost in the median line. No communication between the anomalous bundle and surrounding structures is demonstrable at this height. The structure at *VIIb* is the ascending arm of the root of the facial nerve.

Fig. 6 is taken from a section at the level of origin of the trigeminus. The motor nucleus and the motor root of this nerve lie at *Vm* and *Nvm* respectively, while its sensory nucleus and root lie external to these structures and internal to the brachium conjunctivum (*Brcj*). Its descending root is at *Vd*, and its crossed root at *Vx*. The anomalous structure *b* has subdivided into numerous smaller bundles which lie wedged in between the posterior longitudinal fasciculi. From the anomalous bundles fibres are given off which may be seen running toward the nucleus centralis superior (*Ncs*).

FIG. 7.



Section just below the corpora quadrigemina.

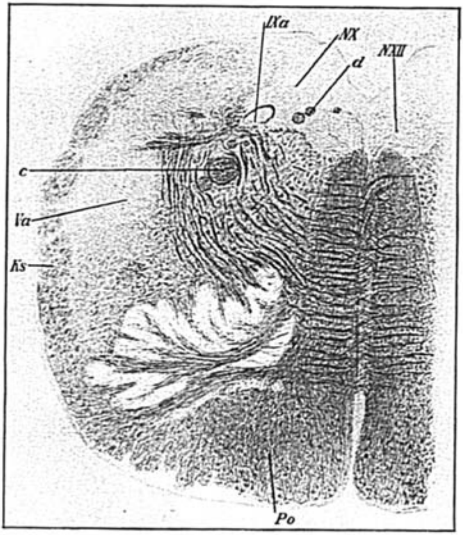
Vd, Descending root of trigeminus. *Brcj*, Brachium conjunctivum. *Lml*, Lateral. *Lm*, Mesial fillet. *Po*, Pons. *Ncs*, Nucleus centralis superior.

In Fig. 7, representing a section through the pons at the level of exit of the trigeminus, the nucleus centralis superior is seen to be of unusual size. The anomalous bundle has disappeared.

CASE II.—The sections are from a medulla showing marked pathological changes, consisting chiefly in multiple degenerations of nerve centres and nerve roots in consequence of tabes dorsalis. In its pathological relations this case will be considered by Dr. Kornfeld in a later article. Of especial interest to us is the presence in this, as in Case I., of true heterotopia of white matter, which again manifests itself in the form of multiple unilateral bundles of nerve fibres.

The more important anomalous bundle, bundle *c*, may be first seen at the level of decussation of the pyramids, whence it passes upward in the lateral column, occupying a position to the mesial side of the substantia gelatinosa. It is circumscribed by arching fibres, and has a diameter at its point of greatest development of about 0.75 mm.

FIG. 8.



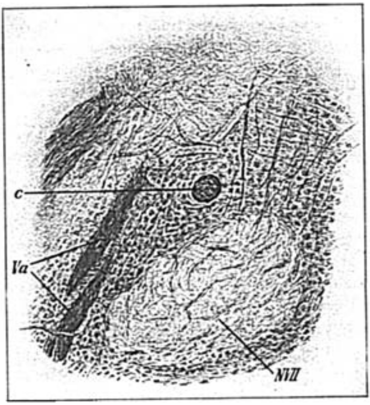
Section at calamus scriptorius.

c and *d*, The abnormal bundles. *NXII*, Nucleus of hypoglossal nerve. *NX*, Nucleus of vagus. *Ks*, Lateral cerebellar tract. *Va*, The degenerated ascending root of the trigeminus. *IXa*, Degenerated ascending root of glosso-pharyngeal.

In Fig. 8, representing a cross section of the medulla at the lower third of the olive, the anomalous bundle is seen at *c*, to the mesial side of the (degenerated) ascending root of the trigeminus (*Va*), and midway between this structure and the respiratory fasciculus (*IXa*). The respiratory fasciculus is made up in this case of degenerated fibres, and it has consequently remained unstained (Pal method). A small secondary bundle is seen external and somewhat ventral of the bundle *c* (*NXII*). Upon the same side of the medulla, midway between the hypoglossal and the pneumogastric (*NX*) nuclei, run several small anomalous bundles of white fibres (*d*). These are of limited vertical extent, becoming lost laterally at the level of the upper third of the olive.

In Fig. 9, representing a section somewhat above the level of exit of the facial nerve, the abnormal bundle *c* is seen lying midway between the nucleus of the facial (*N VII*) and its emerging root (*Va*). It is still nearly circular on cross section and remains sharply circumscribed. The secondary bundle has disappeared.

FIG. 9.



Portion of a section from the lower part of pons.

N VII, Nucleus of facial nerve. *Va*, Emerging root of facial. The abnormal bundle, *c*, between the two.

This bundle *c* may be traced to a point high up in the pons, where it finally becomes lost, due probably to a separation of its fibres at different levels, these then becoming indistinguishable from surrounding structures.*

CONCLUSIONS.—Bundles *a* and *c* correspond, in their location near the substantia gelatinosa, and in their general characteristics, with the bundle of Pick. The origin of bundle *a* from the fibres of the lateral column must be regarded as demonstrated. Although the origin of bundle *c* could not be definitely determined, it seems probable from analogy and from the fact that it was first demonstrable at the level of crossing of the pyramids, that its fibres were derived from the same source. The superior termination could not be determined in the case of either bundle. It seems improbable, however, that either ended in the corpus restiforme as in Pick's case. I am much more inclined to the belief that they accompanied the fibres of the tegmentum and reached a much higher point. This seems especially probable in the case of bundle *c*, which could be traced as such to a point considerably above the level of exit of the facial nerve. An explanation as to the physiological significance of either bundle cannot be offered.

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* The preparations were all stained according to Pal's modification of Weigert's hæmatoxylin method, and in part double stained by the subsequent use of alum-cochineal.

Bundle *b* excites especial interest from the fact of its running for the most part of its course as an unpaired fasciculus situated nearly in the median line. The fact that fibres may be seen entering it from the unusually developed nuclei funiculi teretes, and that at a higher level fibres leave it to stream in the direction of the greatly enlarged nucleus centralis superioris, suggests the possibility that it may serve as an abnormal communication between the cells of these structures.

A second, less plausible, explanation would be that the abnormal bundle was a misplaced conductor sonorus (*Klangstab*). This structure may be unilateral, and has been observed running along the floor of the fourth ventricle nearly parallel with its axis, in which case it has always been of unusual size.[6] The fibres of the conductor sonorus usually end, however, in the vicinity of the cells of the locus cæruleus and not in that of the superior central nucleus, and the explanation would not account for the extraordinary development of the nuclei funiculi teretes, which in this case could be seen actually giving off fibres to the anomalous bundle; hence it may, I think, be rejected as unsatisfactory.

The origin and the termination of the small bundles (*d*) seen running along the floor of the fourth ventricle between the pneumogastric and hypoglossal nuclei could not be determined.

Finally, from a study of our cases we may conclude that the central nervous system possesses, like other organs, a tendency toward occasional misplacement of its elements. This misplacement has, so far, never been observed to occur bilaterally. The most frequent and fairly constant histological anomaly appears to be the presence of a column of white nerve fibres (column *a* and *c*) arising at the level of decussation of the pyramids, and thence proceeding upward, occupying a position internal to the substantia gelatinosa. The fibres of this column may take origin from the lateral or from the posterior column. In certain instances these fibres have been traced above into the corpus restiforme, but this termination has seemed improbable in other cases in which the fibres have apparently extended to a much higher point.

NOTE.—Since writing the above article a communication has been received from Prof. Obersteiner, in which he announces that bundles *a* and *c* have again been observed in his laboratory. They occurred unilaterally in separate medullæ, in each of which there was marked increase in size of the nuclei funiculi graciles. The *Revue Neurologique*, No. 464, contained a short reference to the fact that an abnormal bundle, corresponding with bundle *a*, has been repeatedly observed by Becterew and his pupil Riklinski.

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THE ISOLATED TYPE OF FRIEDREICH'S DISEASE.

By H. J. Mackay, M.B., C.M., Edin.,
of Devizes, England.

Dr. Mackenzie's interesting case recorded in The American Journal of the Medical Sciences for April reminds me that I have a very similar case under my care at the present time, of which the following notes may prove acceptable:

Mabel B., aged thirteen years, first seen in November, 1893. Had then tenderness in knees and ankles, with slight pyrexia. Two days later had precordial pain, and a soft mitral systolic bruit appeared. For this, which remained after the joint symptoms had cleared up, she was detained for some weeks in bed. Toward the end of her stay in bed some jerkiness of the facial muscles, of the head, and of the arm was noticed, which, taken with the rheumatic attack, aroused a suspicion of chorea. The twitchings, however, differed from those of chorea in being shorter in time and less extensive in range than choreic movements are generally. On first getting out of bed, about the middle of December, incoördination of gait was noticed, and ataxia was diagnosticated. She has one brother ten years of age, and two sisters—one fourteen and one three. All are healthy and have good knee-jerks. The mother is a healthy woman; her child-bearing history does not suggest syphilis. The mother's family are said to be all healthy, but one cousin of the patient died from "rheumatism, heart disease, and chorea." The father denies syphilis and exhibits no signs of it, and the family contribute no history of neurosis. The patient has always been a delicate child; had